

## Detection of Current-Driven Magnetic Domains in [Co/Pd] Nanowire by Tunneling Magnetoresistive Sensor

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Current-driven magnetic domain walls in magnetic nanowires have attracted a great deal of interest in terms of both physical studies and engineering applications. The anomalous Hall effect measurement is widely used for detecting the magnetization direction of current-driven magnetic domains in a magnetic nanowire. However, the problem with this measurement is that the detection point for current-driven domain wall motion is fixed at only the installed sensing wire across the specimen nanowire. A potential solution is the magnetic domain scope method, whereby the distribution of the magnetic flux leaking from the specimen can be analyzed directly by contact-scanning a tunneling magnetoresistive field sensor on a sample. In this study, we fabricated specimen nanowires consisting of [Co (0.3)/Pd (1.2)]<sub>21</sub>/Ta(3) films (units in nm) with perpendicular magnetic anisotropy on Si substrates. A tunneling magnetoresistive sensor was placed on the nanowire surface and a predetermined current pulse was applied. Real-time detection of the current-driven magnetic domain motion was successful in that the resistance of the tunneling magnetoresistive sensor changed with the magnetization direction beneath the sensor. This demonstrates that magnetic domain detection using a tunneling magnetoresistive sensor is effective for the direct analysis of micro magnetic domain motion.

## Highly Efficient and Stable Organic Light-Emitting Diodes with a Greatly Reduced Amount of Phosphorescent Emitter

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Organic light-emitting diodes (OLEDs) have been intensively studied as a key technology for next-generation displays and lighting. The efficiency of OLEDs has improved markedly in the last 15 years by employing phosphorescent emitters. However, there are two main issues in the practical application of phosphorescent OLEDs (PHOLEDs): the relatively short operational lifetime and the relatively high cost owing to the costly emitter with a concentration of about 10% in the emitting layer. Here, we report on our success in resolving these issues by the utilization of thermally activated delayed fluorescent materials, which have been developed in the past few years, as the host material for the phosphorescent emitter. Our newly developed PHOLED employing only 1 wt% phosphorescent emitter exhibits an external quantum efficiency of over 20% and a long operational lifetime of about 20 times that of an OLED consisting of a conventional host material and 1 wt% phosphorescent emitter.

## Alignment Control of Patterned Organic Semiconductor Crystals in Short-Channel Transistor using Unidirectional Solvent Evaporation Process

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Organic thin-film transistor (OTFT) is a promising candidate for the driving devices of next-generation ultra-flexible displays due to its extremely flexible structure and low temperature fabrication. Herein, we fabricated OTFT matrix arrays using a simple coating method combining drop casting and selective control of solution wettability on the gate dielectric surface. Uniformly aligned organic semiconductor crystals were created on the TFT channel, and the fabricated short-channel TFTs showed a high mobility of up to 1.5 cm<sup>2</sup>/Vs and large current on/off ratio of over 10<sup>8</sup>. The proposed method is compatible with the fabrication of an organic TFT array over an arbitrarily large area.